Analysis of Aqua Polarization Measurements
(in progress)

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1 Abstract

This report describes the initial problems encountered when analysing the Aqua polarization measurements done by SBRS. The major issues are the non-repeatability of the measured values for polarization filters turned by 180 degrees, detector to detector variability, absence of the expected two-cycle structure for most bands/detectors.

2 Introduction

The Aqua polarization was measured by SBRS. A linear polarization filter was turned by 360 degrees in 15 deg increments. MODIS viewed the filter at 5 different viewing angles (-45, -22.5, 0, 22.5, 45). Up to 3 runs with different settings were made by SBRS, it is not always clear what is the difference between the settings (one example for different settings: some runs were made with charge substract off, some with charge subtract=90), but the results from the different runs do not vary significantly, see below.

MCST has provided the filtered raw data, i.e. 101 frames around the polarized signal and 50 frames of the space view for dark current determination. I also copied the SBRS logbook of the

measurements, which is neccessary to associate the correct angles with the filenames. Sam Xiong at MCST did the analysis at MCST two years ago and has been very willing to answer questions. The Terra polarization analysis has been done by an analyst at MCST who is no longer with MCST. I asked if we could also get the Terra raw data, but Junqiang Sun (MCST RSB calibration head) was very reluctant to commit to anything, since the data is on a tape and does not seem to be in an easiliy accessible format.

3 Footprint of the polarized signal

The image of the polarizer covers the 10 detectors of the MODIS ocean bands and is about 10 frames wide at the center detectors, about 5 frames for the outer detectors. The image moves by up to 1 or 2 pixels up and down for different angles of the polarization filter. MCST has accounted for this by only using those 3 consecutive frames with the maximum values. A possible problem is that the image may be moving left/right as well, which means that the optimum signal might be at e.g. detector 2 for one rotation angle of the polarizer and at detector 5 for another angle of the polarizer. If this is the case, the detectors need to be calibrated relative to each other. I used the prelaunch m1 coefficients from the V4.3.1 LUT to calibrate the raw data. MCST did not account for a possible shift of the optimum signal from detector to detector. On the webpages, the plots for the individual detectors show the polarization signal derived similar to the MCST procedure. The plots labelled 'Max.Det.' assumed that the optimum signal might have shifted between detectors, i.e. after determining the maximum value for 3 consecutive frames for each detector, the detector with the maximum value was chosen to give the optimum signal. This was done for each rotation of the polarizer and for each band separately.

To be continued...